Imperial College London

Module Specification (Curriculum Review)

Basic details

			Earliest cohort	Latest cohort
UID		Cohorts covered	2024-25	
Long title	Physics of Medical Imaging and Radiotherapy			
New code	PHY60007	New short title		
Brief description of module *(approx. 600 chars.)*	This course covers fundamental concepts and advanced topics on a range of clinical imaging modalities and radiotherapies			

120 characters

Available as a standalone module/ short course? N

Statutory details

	ECTS	CATS	Non-credit		
Credit value	7.5	15	N	HECOS codes	
FHEQ level	Level 6				

Allocation of study hours

	Hours	
Lectures	19	
Group teaching	4	*Incl. seminars, tutorials, problem classes.*
Lab/ practical	0	
Other scheduled	10	*Incl. project supervision, fieldwork, external visits.*
Independent study	154.5	*Incl. wider reading/ practice, follow-up work, completion of assessments, revisions.*
Placement	0	*Incl. work-based learning and study that occurs overseas.*
Total hours	187.5	
ECTS ratio	25.00	

Project/placement activity

Is placement activity allowed? No

Module delivery

Delivery mode	Taught/ Campus	Other	
Delivery term		Other	Term 2, exam in term 3

Ownership

Primary department	Physics
Additional teaching departments	None

Delivery campus	South Kensington

Collaborative delivery

Collaborative delivery?	Y

External institution	ICR and Imperial NHS Healthcare Trust
External department	
External campus	

Associated staff

Role	CID	Given name	Surname
Lecturer		Chris	Dunsby
Lecturer		James	McGinty
Lecturer		Uwe	Oelfke

Learning and teaching

Module description

Learning outcomes	On completion of this module you will be able to: 1) Explain and discuss the physical principles underlying the interactions of x-ray radiation with tissue and how these can be used to generate contrast in an x-ray image 2) Explain the principle behind tomographic image reconstruction 3) Explain and discuss the generation of radionuclides for medical imaging and how they may be detected in gamma cameras, SPECT and PET imaging systems 4) Demonstrate an understanding of the physics underlying magnetic resonance (MR) imaging and how MR imaging systems can be used for medical imaging 5) Explain and discuss the principles of ultrasound imaging and how the physical interaction of sound with different tissues can be used to generate contrast in an ultrasound image 6) Demonstrate an understanding of image quality and what determines this in different imaging modalities 7) Discuss the advantages and disadvantages of different medical imaging modalities 8) Explain the physical principles underlying the interactions of ionising radiation (gamma, beta, proton and ion) with tissue and how these can be used in therapy
Module content	a) X-ray imaging and tomography b) Nuclear imaging, including radionuclide production, gamma cameras, SPECT and PET c) Nuclear medicine d) MRI e) Ultrasound imaging

Learning and Teaching Approach	The course is delivered as a series of lectures (1 intro + 18 lectures) introducing different imaging modalities and concepts that cut across all of these. After the lectures, the students will work in small groups to prepare a problem sheet-style question with answers on an assigned topic. Seminars will be available where students can work on this in class and discuss questions with staff. The questions will then be distributed to the whole class and each group will grade and give feedback on the questions prepared by the other groups. At the end of the course, the students will work in groups on a project on which they will write a report. Each group will have an academic supervisor and will meet with their supervisor several times during the project.
Assessment Strategy	Assessment is based on: 10% on the problem sheet excercise (50% peers, 50% academic staff) 35% for the report (100% academic staff) 55% final exam on the material covered in lectures (rubric: answer all questions) For the report, each group member will return a survey on the relative contributions of all group members. If the contribution of any group member differs from the average by more than 20%, then each group member's mark will be scaled by the average of the relative contributions returned by the other group members.
Feedback	Peer and staff feedback on the problem sheet-style questions and answers Formative feedback during report research meetings with supervisor Summative staff feedback on report
Reading list	Material covered in lectures will be available via Panopto and will be supported by notes. Textbooks used will include: • The Essential Physics of Medical Imaging (2nd Edition), Bushberg, Seibert, Leidholt & Boone (Lippincott, Williams and Wilkins) • Medical Imaging Physics (4th Edition), Hendee & Russel Ritenour (Wiley Liss) • The Physics of Medical Imaging, Webb (Taylor & Francis) • Physics in Nuclear Medicine (3rd Edition), Cherry, Sorenson & Phelps, (Elsevier) • Radiobiology for the Radiologist, Eric J. Hall and Amato J. Giaccia, Wolters Kluwer

Quality assurance

Date of first approval	
Date of last revision	
Date of this approval	
Module leader	Chris Dunsby

Office use only

QA Lead	
Department staff	
Date of collection	
Date exported	
Date imported	

Notes/ comments	

Template version 16/06/2017

Programme structure
Associated modules

UID	Legacy code	Module title	Requisite type

Assessment details

		Pass mark
Grading method	Numeric	40%

Assessments

Assessment type	Assessment description	Weighting	Pass mark	Must pass?
			40%	
Examination	90 minute exam on material covered in lectures	55%		N
Coursework	One report prepared in small groups and assigned a single mark. Max 5 pages and max 1500 words per group member. Groups of approximately 4 students.	35%		N
Coursework	Problem sheet and answers exercise done in small groups and assigned a single mark	10%		N
		100%		